# NorthEast Area Study

Project Workbook | January 2014



The complete summary report of the methods and recommendations for the NorthEast Area Study

Capital Area Metropolitan Planning Organization prepared by Stantec Consulting Services Inc.



## NEAS 2014 NEAS Northeast Area Study

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## **Acknowledgements**

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# PROJECT 01





## Introduction/ Problem Statement



Wendell Post Office, ca. 1890 (source:Wendell Historical Society)

## **INTRODUCTION/ PROBLEM STATEMENT**

The Northeast Area Study (NEAS) was initiated by the North Carolina Capital Area MPO (NC CAMPO) to identify a sustainable transportation strategy for the growing communities of Wake Forest, Knightdale, Raleigh, Wendell, Zebulon, Rolesville, Bunn, Franklinton, and Youngsville. This region encompasses 374 square miles of a unique mix of a large metropolitan area, small towns, suburbs and farming communities painted across a broad expanse of rural tapestry in both eastern Wake and southern Franklin counties. Wake County is the 9th fastest growing county in the United States, and Franklin County has proved similarly attractive due to resources and proximity to major metropolitan employers as well as the Research Triangle.

The study focused on an integrated approach that considered land use development initially, followed by transportation scenarios that took into account an array of factors to find the best, most cost-feasible set of recommendations. The people in these communities brought their concerns, initiative, needs, and innovation to a comprehensive vision for the Northeast Area. One day you will be able to walk safely on a sidewalk to your bus stop; travel safely on the roadway without undue congestion; bicycle to school with your child; and experience the plan that was created through your efforts. From Legos<sup>™</sup> to computerized transportation models to rendered visions of "hot spots," this plan wove together these communities into a fabric that will bring health, vitality, and opportunity to all citizens and attract employers.

## **STUDY AREA AND PARTNERSHIPS**

The NEAS study area encompasses the following communities in Wake County: Wake Forest, Knightdale, Raleigh, Rolesville, and Wendell; and in Franklin County: Youngsville, Bunn, and Franklinton. It is a large area – over 370 square miles, larger than 31 of North Carolina's counties. The diversity of the area in terms of its people may be even greater: 10% of the study area self-reports as Hispanic, for example. Figure 1 lays out the study area and municipal framework.



Figure 1. The NEAS Boundary and Partners (Wake and Franklin Counties)

"An important aspect of the LRTP is that it has to be updated at least every five years – hence, any changes in direction can be accommodated readily. **Things change, and they will do so again.**" This project was initiated and funded primarily by the Capital Area Metropolitan Planning Organization (CAMPO) and completed in partnership with Bunn, Franklinton, Knightdale, Raleigh, Rolesville, Wake Forest, Wendell, Youngsville, Zebulon, as well as Wake and Franklin counties, Triangle Transit, North Carolina Department of Transportation (NCDOT), and other transportation and land use regulatory agencies and their stakeholders.

## IMPORTANT CONTEXTS INFLUENCING THE SHAPE OF THE NEAS PROJECT

The ultimate disposition of the Northeast Area Study recommendations will be "rolled into" the long-range transportation plan, a document and process required of all metropolitan planning organizations (MPOs). This document becomes the guiding document for projects that receive federal and state funding across all modes of travel, which are the principal sources of financing for major transportation projects in this region. An important part of the context of the NEAS Project during its formation was the shifting priorities assigned to various "tiers" of transportation facilities – Statewide, Regional, and Division. State law was changed at the outset of this project that altered how much money would be allocated to each of these three regional tiers, and the way that projects were prioritized to receive funding was also changing. The NEAS Project therefore had to react to these changes which in some cases were fairly significant (for example, the new law that restricted state funds from matching federal funds for bicycle/pedestrian projects).

This being said, the NEAS and the CAMPO long-range transportation plan (LRTP) are visionary documents looking out 30 or more years. In the context of timeframe, the recommendations should not be closely aligned with short- or medium-term policy decisions enacted at any level of government. Instead, the priorities, policies, and project evaluations conducted in this document represent what was thought to be the most reasonable blending of current contexts and what the communities in our study told us that they wanted to see happen over this generational span of time. An important aspect of the LRTP is that it has to be updated at least every five years – hence, any changes in direction can be accommodated readily. Things change, and they will do so again.

The following sections of our Project Workbook describe the basic project planning framework as well as key modal recommendations stemming from this comprehensive process.



# PLANNING 02





# Chapter II: Planning Framework

## **GUIDING PRINCIPLES**

- The most important part of this study was communication: talking to stakeholders, elected officials, and many different people across a very large geographic space. Not only was the process challenged but by space, but also by time: a key question in every long-range planning process is how to get people to "see" beyond what they encountered when they drove to the public meeting, to work, or to school that day. In order to make this communication happen at a meaningful level, the project approach used a variety of outreach techniques
- 2. Second, the project team wanted to make certain that they considered the technical components of the work in such a way that the layperson could not only access the same information that the consultant and staff were using, but played an integral role in developing various aspects of the work products. In order to make that happen, the project team used a variety of graphics, presentations, and performance measures to distill "heavy" content into something that was useful to many people.
- 3. Third, the project team of CAMPO and consultant staff, and the steering committees (Core Technical Team and Stakeholder Oversight Committee, or CTT and SOT, respectively) recognized that the policies of individual governments that were generally balkanized when considering effects outside of their own corridors (e.g., US Highway 1, US 401, and US Hig way 64) and counties, were critically important over the long haul in creating the recommended projects and environments that people said that they wanted to see happen in their future. Policies have an especially important place in areas and time periods when large-scale capital infusion from state and federal governments are generally unlikely or in a declining trend.

The following sections of the report discuss in greater detail what was discovered through the public process, both externally and through the two steering committees. A separate document – the Policy Guidebook – specifically describes excellent practices that the NEAS municipalities and counties can follow in order to achieve some of the goals people described to the project team throughout the life of the study.







## **PUBLIC OUTREACH METHODS**

As mentioned, the design of NEAS intentionally worked to create as many venues and opportunities for different segments of the public to participate in the planning process. Figure 2 names the outreach methods and provides some information about the appropriateness of each one to reaching certain segments of the public as well as the level of detailed input it provided to the process. Each method is briefly described in the following paragraphs.

Traveling Roadshows and Youth-Oriented Roadshows. The traveling roadshow concept was divided into three separate parts, but all of the versions of this technique involved taking materials and planning concepts to places to get feedback where the public already meets. The first phase of roadshow met with several groups around NEAS to present them with an overview of the project and to acquire information on their specific transportation issues. The project team used a "light table" incorporating CommunityViz<sup>™</sup> software that allowed participants to point a laser pen at a projection of the study area, then move icons representing different kinds of land uses anywhere on the map. Facilitors helped translate the technical requirements and address any issues. One variant of the traveling roadshow was conducted in a Mexican restaurant and was directed at Hispanic workers and families; another version presented to two children's groups featured memory mapping, and Lego<sup>™</sup> block creation of new kinds of neighborhoods that children wanted to see.



The "One Voice" document has more information about the public engagement process for NEAS

Outreach Technique	General Public	Elected Officials	Hispanic Outreach	Detail of Input	Low Income	Youth
Traveling Roadshows	٠		• • •	• • •	٠	
RoboCall	٠	•	•	••	• • •	
Social Media	•	•	•	٠	٠	• •
MetroQuest	•	•		• • •	٠	•
Questionnaire (Paper)	•	•		••	٠	
Youth-Oriented Roadshows	•		•	• • •	• •	• • •
Board Briefings	•	•••		••		

Figure 2. Outreach Methods and Effectiveness within Specified Demographics







**RoboCalls.** Automated telephone calling, termed "robocalling," was also employed for the NEAS Project. Exactly 509 people responded to the automated calling system over a two-day period. Robocalls are limited to multiple choice responses (not open-ended), so the range of questions was more limited than with other methods, but the size of the sample and completeness of the survey, along with the ability to cross-tabulate responses by age and other responses, were unique aspects of this survey.

**Surveys (MetroQuest & Paper-Based Questionnaire).** Traditional surveys were employed both in paper-based formats and on-line, not only to gain input from the public but from the CTT to identify potential "hot spots" for detailed analysis. The MetroQuest<sup>™</sup> survey tool is an on-line software application that was used twice: once to gather specific issues and locations (similar to the light table exercise from the first round of traveling roadshows described previously), and again to identify priority recommendations for different modes of travel and preferred financing mechanisms to pay for the improvements.

**Social Media.** Few social enterprises would be considered complete without a presence on the Internet. Facebook and a dedicated project website were used during the study. The website was primarily used to help stakeholders and the CTT/ SOC members keep track of information and events; Facebook was used primarily for public dissemination of events and points of interest. Facebook sites hosted by several of the towns and counties were posted to during the course of the study as well. The NEAS Facebook site provided information to 6,542 views and over 1,000 "clicks" were recorded over the life of the study. Notably, the project website was managed by the Project Director of the consultant staff. This arrangement allowed for much more frequent and responsive updates of the site than would have been the case had a different person or firm managed the project's Internet presence.

**Board Briefings.** In order to communicate with elected officials, three rounds of board briefings were conducted for the NEAS Project. The first was to gather information on issues and present the framework of NEAS; the second was to gain input on preliminary findings of the land use and transportation scenario assessments; and the third to present the draft recommendations. Board briefings were conducted for each municipality and both counties in each of the three rounds for a total of 35 meetings (two were conducted for the Wake County Planning Commission in each of the first two rounds of the project; the final presentation was prepared for the Wake County Board of Commissioners). Periodic updates were also made to the Capital Area MPO policy and technical boards.

**Project Symposia.** For open public meetings, the project team invited elected officials and other stakeholders directly, as well as advertising through email lists and the CTT/SOT mailing lists. Approximately 80 people attended the first Symposium to gather at workstations to state their issues concerning land use, bicycle, pedestrian, transit, roadway, health, and traffic concerns.; 60 people attended the second one to discuss project priorities using a mobility chip game that allowed the participants to paste their desired projects directly to maps.



While not one of the primary data-gathering events, about 20 participants rode with our Project Manager and others to experience cycling conditions first-hand during a group bike ride.



The outcomes of each of these engagement strategies, as well as numerous data gathering and analysis techniques, were used to develop the context of the planning area; land use and transportation strategies; and gather input on the ideas and generate refinements to create this final report.

## **POINTS OF CONCERN**

Based on the various public input techniques described, the people of NEAS identified a variety of key concerns expressed in the following bullet points.

- Protection of farmland/open space was important to wealthier residents, but not as much for poorer income stratifications
- Wealthier people tended to favor more greenways & education as improvements to bicycle/pedestrian travel while poorer people wanted more bus service
- 43% of the people surveyed have work commutes under 15 minutes; this
  was interesting given that the average commute times for both Wake and
  Franklin counties were 10-20 minutes higher than this figure in the last
  reported Census
- Improvements to both auto and transit speed & convenience were wide spread desires
- In terms of land use, more shopping opportunities along US Highway 64 and inside the small towns were clear desires of many people surveyed; in general, more density in the towns themselves were identified as desirable

In addition to these issues raised by the public during our outreach efforts, there were a number of additional issues that helped evolve the various modal considerations described in subsequent chapters. The Regional Snapshot in the next chapter provides the contextual overview of the complex NEAS project and its not it's people.



# REGIONAL 03





## **Chapter III: Regional Snapshot**

#### **REGIONAL MOBILITY**

The Northeast Study Area, which encompasses northeastern Wake County and Southern Franklin County, is mostly comprised of two-lane roadways with speed limits of 55 miles per hour. There are a few major corridors and state routes that cross the area. All Average Annual Daily Traffic (AADT) counts were collected by NCDOT in 2011. AADT's are measured in vehicles traveled per day (vpd), both directions. This synopsis details the highest AADT on each corridor and location. For many people and even users of this document, the roadways and their capacity serve as the primary basis for decisionmaking in a transportation plan – this aspect is important to NEAS as well, but we will discuss how roadways and their "completeness" or lack thereof work with other modes of travel besides the private automobile.

**I-540:** is an interstate route that makes the southwestern border of the study area. It is a six-lane, controlled access facility with direct access to both US 64 and US 64 Business in Knightdale and a 70 mph speed limit. **AADT: 55,000 vehicles per day (vpd) (near Buffaloe Road).** 

**US 64/264** is an east-west route from Raleigh to Zebulon. It is a six-lane controlled access facility from I-440 to US 64 Business near Wendell. From Wendell to the east, it is a four-lane controlled access facility. The speed limit is 70 mph and forms the high-speed corridor backbone for the southern section of the study area as it connects Raleigh to Knightdale, Wendell, and Zebulon and points east. US 64 and US 264 split just east of Zebulon. **AADT: 63,000 vpd (near Smithfield Road).** 

**US 64 Business** connects Raleigh to Knightdale, Wendell, and Zebulon and paralleling US 64/264. Through Knightdale, it is both a four-lane and six-lane divided highway with 45 mph speed limit. It crosses US 64/264 just west of Wendell and then narrows to a two-lane downtown route in both Wendell and Zebulon. **AADT: 28,000 vpd (near I-540)**.

US 401 is a northeast-southwest route that connects northeast Raleigh to Rolesville and southern Franklin County. US 401 is in a state of transition and has many different roadway types along its length within the area. US 401 is a six-lane divided highway from I-540 to Mitchell Mill Road with a 50mph speed limit. From Mitchell Mill to Louisbury Road just south of Rolesville, it is a four-lane divided highway with 55 mph speed limit. At that point, US 401 becomes a two-lane roadway with a 35mph speed limit through Rolesville and then a 55 mph speed limit to the northern border of the area. The Rolesville bypass (TIP R-2814B) is currently under construction and will be a continuation of the four-lane highway that will reconnect with existing US 401 just north of NC 96. Besides NC 96, US 401 connects with NC 98 just east of Wake Forest and NC 39 in Louisburg. US 401 is one of driving forces behind economic development in the Region. **AADT: 39,000 vpd (near Mitchell Mill Road).** 

![](_page_18_Picture_1.jpeg)

Figure 3. Distribution of Vehicular Crashes, 2007-2011

**NC 98** is an east-west roadway that connects Wake Forest to Bunn and other points east of the study area. A portion of the NC 98 Wake Forest Bypass is included in the area. This section is a four-lane, divided highway with 55 mph speed limit from US 1 east to Jones Dairy Road. From this intersection, NC 98 is a two-lane highway with 55 mph speed limit outside of Town Limits. NC 98 connects with NC 39 in Bunn and has both 35 mph and 20 mph sections within Bunn.

## AADT: 19,000 vpd

(near NC 98 Business and Jones Dairy Road).

**NC 96** is a major corridor through the Region as it connects many of the communities. NC 96 runs northwest-southeast and connects Youngsville, Wake Forest, and Zebulon. It connects to both NC 98 and US 401 east of Wake Forest and both US 64 and NC 97 in Zebulon. NC 96 also is the main north-south corridor through Zebulon and is currently under study by the Town for improvements. Most of this corridor is a two-lane highway with varying speed limits. Notably, this corridor experiences relatively high truck volumes, identified as a special concern by Youngsville representatives since the road becomes the main street as it passes through the Town.

## AADT: 18,000 vpd near US 64/264) and 11,000vpd (Downtown Youngsville).

**NC 39** runs north-south from Zebulon to Bunn and then to Louisburg. NC 39 connects with US 64, US 264, and NC 97 east of Zebulon and connects with NC 98 in Bunn. Most of NC 39 is a two-lane highway with 55 mph speed limit.

## AADT: 5,500 vpd (near Cedar Creek crossing and study limit).

**NC 97** starts at US 64 Business just west of Wendell and runs east-west to the study area boundary near NC 39. NC 97 is the main east-west route through downtown Zebulon and is mostly a two-lane highway with varying speed limits. **AADT: 12,000 vpd (Downtown Zebulon).** 

The distribution of crashes is not only clustered along these major arterials **(Figure 3).** Gateway roads leading into and out of each town, as well as secondary streets connecting to the larger arterials, are also highlighted in the crash distribution.

![](_page_19_Figure_1.jpeg)

Figure 4. Fatal Crash Distributions by Population (top) and Crashes wtih Fixed Object (source:NCDOT, 2006-2010 Crash Data)

A better understanding of the roadway network influences the NEAS Project in several ways. For example, many of the roadways outside (and many inside) town boundaries are relics of an earlier age before the rapid suburbanization process that increased the number of people, jobs, and consequently vehicular trips. This has put more pressure on the limited capacity of these two-lane, narrow-shouldered roadways and non-standard intersections than the original designers anticipated. The desire for a modern era of higherspeed (greater than 45mph) travel overlaid onto this roadway network results in a frequency, distribution, and severity of crashes different than expected. Not all of the accident types are similarly distributed or simply according to population. For example, accidents involving fixed objects are weighted towards the NEAS boundary (and other lower-density environments) compared to the overall distribution that generally follows population distributions (see image at left). We also suspect that bicycle and pedestrian accidents are more frequent in NEAS given the rate of pedestrian and cycling activity in the study area, although that opinion is somewhat subjective since rates of pedestrian and cycling activity are low and generally not collected for all trip types. Crash data and field observation also played a crucial role in determining the location of Hot Spots, focused studies on improving intersection geometry to reduce their accident potential.

An important, although not paramount, concern was how the roadway network would be able to manage ever-larger volumes of traffic that will be placed upon it as the Region grows in population through 2040. Figure 5 provides a partial answer derived from the Triangle Region Travel Demand Model (TRM). "Hotter" colors indicate that a volume of traffic is approaching the desired capacity of that particular section of roadway. While the most recent base year of comparison (2010) indicates relatively few streets approaching capacity, the outer horizon year (2040) foreshadows a more pervasive set of congested conditions, stretching out along major arterial surface streets to every town in the study area. It was from these congestion maps that the project team derived the general direction of major roadway improvements and policies intended to improve automobile capacity.

![](_page_20_Figure_1.jpeg)

Figure 5. 2010 (left) and 2040 Volume-to-Capacity Distributions

### **LIVABILITY & HEALTH**

**Franklin County.** Much of Franklin County's context in terms of land use, transportation systems and other aspects of the built environment are typified by a rural landscape dotted with small towns and crossroads communities. This context is traditional for the area but is planned to transition in the southern reaches to more suburban-style development as demand for housing in the Triangle Region stretches northward. An anecdotal argument made by some Franklin County residents, as well as by observation of conditions on major arterials in the study area, is that the levels of congestion as well as distance and economic climate overall are negatively impacting the growth potential in Franklin County.

Currently, the rural and small town nature of Franklin County within the study area offers both opportunities and challenges related to the health of residents. Opportunities exist to plan for future integration of land uses that provide increased mobility options to access to health care facilities and places that promote physical activities, such as parks, greenways, and recreation areas. The opportunity also exists to plan for a transportation system that promotes access to health-related land uses and destinations.

**North / Northeast Wake County.** While Wake County consistently ranks as the healthiest county in North Carolina and one of the healthiest in the United States, the overall county ranking does not account for pockets of Wake County where data indicates poor health is more prevalent. Health professionals in Wake County have indicated that a lack of local area health data (e.g. at the town, community or Census tract level) limits their ability to identify areas where pockets of poor health reside. The rural areas of north and northeast Wake County have been identified as pockets where there is a higher prevalence of poor health indicators. The area is rapidly growing, particularly along the US 1, US 401 and US 64 corridors. Much of this growth is typified by small town center growth, suburban-level housing densities, and "big box" retail and associated commercial land uses. The resources available to towns within the study area as a result of this growth have led to increased investment in parks and recreation facilities; greenways and trails; and sidewalks within residential subdivisions and in pockets along major highways.

The text boxes on the following page summarize some of the major health considerations in both counties.

![](_page_22_Picture_0.jpeg)

The principle health-related issues for both Franklin (top) and Wake Counties are shown here.

## FRANKLIN COUNTY HEALTH SUMMARY

## **HEALTH PRIORITIES**

- Access to care.
- Physical activity and nutrition, including chronic diseases and obesity.

## **TOP 5 LEADING CAUSES OF DEATH**

- Cancer (23.9%)
- Chronic respiratory diseases (6.0%)
- Cerebrovascular diseases (5.3%)
- Unintentional injuries (3.6%)

### **AREA CHARACTERISTICS**

- Predominantly rural area with pockets transitioning to suburban development.
- Limited active transportation facilities (sidewalks, bike lanes and greenways) along rural routes or within small towns.
- Data indicates pockets for potential poor health of citizens in and around the Bunn area, south of Louisburg and near Franklinton, based on Census information.
- Childhood obesity rates increased 33% to 34.6% of children, ages 5-11 (2000-2008).

## WAKE COUNTY HEALTH SUMMARY

## **HEALTH PRIORITIES**

- Wake Forest, Rolesville, Lassiter area: Overweight and Obesity; Lack of health insurance.
- Zebulon, Wendell, Knightdale area: Lack of health insurance; unemployment.

## **TOP 5 LEADING CAUSES OF DEATH**

- Cancer (25.9%)
- Heart Disease (19.9%)
- Cerebrovascular diseases (5.9%)
- Chronic respiratory diseases (4.9%)
- Unintentional injuries (3.6%)

## **AREA CHARACTERISTICS**

- Rapidly transitioning area: rural to suburban development.
- Increasing number of active transportation facilities (sidewalks, bike lanes and greenways), primarily within towns and along the Neuse River.
- Data indicates pockets for potential poor health of citizens in and around the Knightdale, north of Wendell and Zebulon area, based on Census information.
- Childhood obesity rates increased 56% to 26.1% of children, ages 5-11 (2000-2008).

![](_page_23_Figure_1.jpeg)

Figure 6. Demographic Indicators of Poor Health

The overall study area health was assessed using key indicators to provide a snapshot of the existing "health" of the region. The indicators for prevalence of poor health are based on Census tract data for demographics such as age, race, and income, to name a few. These indicators have been identified by health researchers as the Census-related data that is most pertinent to identifying pockets of poor health within a community.

The existing health assessment based on demographic indicators is presented in Figure 6. High prevalence indicates that over 60% of the demographic fields were higher than the area population average. The other indicators are divided as follows: Moderate–to–High (40%-60%), Moderate (20%-40%), and Low Prevalence (less than 20%). It is important to note that both counties have completed a Community Health Assessment (CHA) since 2010, and that Wake County is in the process of updating their CHA.

Health-related findings influenced our recommendations in several ways. First, we began to see very obvious connections between low-income communities and clusters of pedestrian and bicycle accidents in otherwise relatively rural parts of the study area. These relationships are somewhat subjective, but fall into too small a geographic space to be discoverable using traditional third-party data like the U.S. Census. Our recommendations become more oriented towards these areas than otherwise might have been the case. Second, although we found considerable support for increasing the levels of development activity in already-developed areas (e.g., town centers), we found further impetus in creating strong cores of activity around which walking, cycling and transit modes of travel would work well in at least a supporting role to private automobile travel. It is in these mixed-use centers that affordable housing, reductions in the rate of automobile ownership, and other favorable conditions can evolve to support a broader array of grocery, health/clinic, and other lifestyle elements that are not in great abundance in the NEAS boundary. We paid special attention to Youngsville and Bunn to help create corridor concept designs that favored more active lifestyles.

![](_page_24_Picture_1.jpeg)

## **ECONOMIC VITALITY**

The economic vitality of the NEAS project area is generally sound, with more than 25 companies/entities employing over 1,000 people in Wake and Franklin Counties. In Wake County, the education and health service businesses occupy four of the top six employers, while seven of the top ten are related to public institutions. Notably, the Wake County Public Schools system and NC State University occupy the top spots in terms of employment numbers. In Franklin County, only four of its top ten employers are publicly funded, but one of those, the Franklin County Public School System, employs more than 1,000 people.

In terms of industry, the Northeast Study Area produces more building ma-

![](_page_24_Figure_5.jpeg)

terials than are locally demanded; but that is the only industry that has recorded a recent surplus (greater than local demand). This portion of the study area lacks non-store retailers, electronics, appliances, furniture and home furnishing stores.

The average household income in the Northeast Area Study is \$73,832, an increase of 32.4% between 2000 and 2010 (Figure 7.The increase is likely a function of the transition in resident employment form blue collar rural and industrial to high-tech and business employment outside the study area in Raleigh and the Research Triangle Park-related business cluster.

Figure 7. Household Income, NEAS

As the NEAS transitions away from an agricultural-based economy towards a suburban and retail-driven economy, household income rates are continuing to increase. However, this increase is being driven by those employed in jobs outside of the study area: " Ninety (90%) of people living in the study area work outside of the study area. "

The search for higher-paying jobs and the shrinking of place-based rural jobs economy will force more people into peak period traffic conditions. Another economic aspect to the NEAS Project was the desire to create a more balanced and diverse economy in the several small towns and rural communities – many people said that they wished for more and higher-end retail opportunities, or places to take their children, or entertainment options, or restaurants and grocery stores. The way to attract these opportunities is to create upscale environments for them to locate within.

![](_page_25_Figure_1.jpeg)

Figure 8. Natural Resources, NEAS

### NATURAL ENVIRONMENT

**Hydrology.** The Northeast Area is divided into two river basins. Wake County drains south and east into the Neuse River. Though areas in Franklin County that border Wake County are also located in the Neuse River Basin, the remainder of the county drains east to the Tar River which forms the northeastern boundary of the study area. The Neuse River enters the study area between Raleigh and Wake Forest and forms the western boundary of the study area south of I-540. Poplar Creek, Marks Creek and the Little River are the main watercourses in Wake County. Cedar Creek, Crooked Creek and Moccasin Creek are the main streams in Franklin County. At approximately 18,757 acres and 19,333 acres, respectively, wetlands and floodplains present a minor constraint for development in the area. These development constraints are depicted on Figure 8

There are four water supply watersheds located in the area: the Tar River, Little River, Smith Creek and Fantasy Lake. This designation, which encompasses approximately 94,291 acres of land, limits the density of development in order to protect local water supplies. While they are constraints to development, they have been displayed separately on Figure 8.

There are 28 Significant Natural Heritage Areas (SNHA) in the study area. There are some rare areas of exposed granite that support unique plant and animal habitats. Mitchell's Mill State Natural Area contains some of these granitic flatrocks, others are located near Lake Mirl, Pulleytown Road, Hodges Mill Creek and Fowlers Mill Creek. The remaining key environmental features are associated with hydrological features. The Middle Tar River and the Little River, for example, provide highly significant aquatic habitat.

![](_page_26_Picture_0.jpeg)

![](_page_27_Figure_1.jpeg)

Figure 9. Location of Preferred Land Uses (MetroQuest Survey)

**Soils.** The majority of soils in the study area (75%) are classified as "Prime Farmland", "Farmland of Statewide Importance", or "Farmland of Local Importance" by the Natural Resource Conservation Service (NRCS). Hydric soils, defined as those that under natural conditions are either saturated or inundated during the growing season, pose a minor constraint for development. Soils that are considered hydric or partially hydric make up 19% of the study area (45,000 acres). The majority of these soils are located in low-lying areas adjacent to streams and wetlands. The NRCS classifies the septic tank absorption capacity of 50% of the soils in the area as "Very Limited". This indicates that the soil has attributes that may result in poor septic tank performance and high maintenance costs.

The environment plays a substantial role in the recommendations of the NEAS Project, principally providing a set of restrictions and policies related to watershed protection. However, farmland preservation is an important companion to overall open space protection. A number of people said that they originally located to their community specifically because of the rural "feel" of the place. As with other context variables, the direction given was to favor already-developed areas and towns with additional construction, and reduce the impetus for constructing new roads and buildings in what came to be known as the "Green Heart" of the NEAS. The desired development of various land uses is especially pronounced in the survey results when asked to locate where the most growth was going to occur and desired to occur in NEAS (Figure 9). Development desired was clustered around towns and major corridors.

![](_page_29_Picture_0.jpeg)

# scenario 04

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## REGIONAL SNAPSHOT Chapter III: Regional Snapshot

## **PLANNING SCENARIOS**

Generally, long-range planning studies similar to the Northeast Area Study have focused on a narrowly defined set of evaluation tools, typically related to a time-based level-of-service analysis. For the NEAS Project, our steering committees and professional staff wanted to reflect some of the core concerns of these groups as well as what the general public indicated in our surveys and in-person discussions. People understand that transportation systems don't simply move people and goods from one place to another with greater or lesser efficiency; the way that this service is delivered has major implications for how people will likely make their trip (mode), when they choose to make it (time of day), and how long it will take them (travel time). Even further, the transportation network ultimately is only part of a feedback loop that influences the very environment that creates the demand for trip-making in the first place. For example, a transportation system that features very highcapacity streets that moves as many cars as efficiently as possible will likely result in a lower level of service for other modes of travel (excluding, perhaps, some forms of public transportation) and ultimately create a physical environment that reinforces that method of travel. Hence we have seen the rise (and often languishing) of "strip" commercial development, large office parks, and far-flung tract subdivisions. The historical prevalence of these development types is not an accident or even purely market-driven. Lending institutions, municipal zoning codes, public expectations, construction practices, and other forces have moved the ball in this direction for at least the past five to six decades. However, as more people find themselves facing increasing levels of traffic, or they are finding it difficult to age in their current place,

or find the expenses involved in maintaining two or more cars increasingly infeasible, this development pattern is changing. People are not just moving to the most square footage for their money, the old "drive 'til you qualify" perception of development. Younger people are waiting longer to get their driver's licenses, and many would prefer to live in places where driving is infrequent or even optional. Where large suburban-style home developments are still occurring, the variety of housing types is increasing, as is the number of amenities and design features aimed at improving walking conditions.

Some of this knowledge helped to guide us towards our suggested planning scenarios that were used initially to collect the inputs from many people as well as the guidance offered by the professional planning and design staffs employed by the towns, city, and counties in the NEAS. The following are the primary scenarios that were used to help shape the final, preferred land use scenario. From this scenario, an assessment of demand was created and applied to the transportation network to gain an understanding of where improvements were most crucial. These scenarios were evaluated using the performance metrics described in a subsequent section.

**Current Plans (CP).** The CP Scenario was what its name suggests: a compilation of the current planning policies and plans expressed as a group of land use typologies. The CP Scenario also served an important purpose: it was the baseline against which other, alternative futures were compared and contrasted.

"Many small and medium-sized cities have developed the business, demographic and lifestyle amenities of big cities. While smaller cities may not have the total number of quality employees and amenities of larger cities, on a per-capita basis, they are very competitive locations for businesses."

- Antonio Ubalde, CEO of ZoomProspector.com

## SCENARIO PLANNING Performance Metric

![](_page_32_Figure_2.jpeg)

![](_page_32_Figure_3.jpeg)

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Figure 10.Top to Bottom: CP, AIT, and TCP Scenarios as Shown by their Population Densities

All-In Transit (AIT). This scenario focused almost exclusively on adding new transit capacity and routes throughout the NEAS boundary. Only roadway projects that are already programmed or under construction were assumed to be a part of the AIT Scenario. New passenger rail service in the US 64 and US 1 corridors were assumed, as well as considerable focus on town-wide development at the expense of greenfield construction.

Town Center Plus (TCP) and Town Center Plus Employment (TCPE). The TCP Scenario also focused most of the forecasted population and employment growth inside municipal boundaries, although not to the same extent as the AIT Scenario. Unlike the AIT, the transportation measures employed included many roadway capacity improvements as well as a more limited set of transit service increases. The TCPE Scenario was in concept the same as its parent TCP Scenario, but added 18,000 more employees to the NEAS area, principally inside the towns. This scenario was only created to examine the effect that having two-way traffic would have on the levels of congestion on roadways inside the study area. The TCPE Scenario was not considered beyond the initial testing stage of this study – issues related to where the employment would be generated and balanced in the rest of the Triangle Region as well as very minor improvements to congestion conditions almost entirely contained on the east side of Raleigh did not warrant carrying this scenario further into the analytic process.

As mentioned previously, while many long-range planning documents tend to focus primarily on automobile travel time savings as their primary metric for measuring success, the NEAS Project added several additional measures of performance to reflect the array of opinons received by the public during our outreach process. The following measures of performance were identified as most closely matching up with the objectives of the steering committees and the public, and were chosen in part due to the availability of quantifiable data to populate the measure for each of the draft, sketch-planning level scenarios described in the previous section.

## DEVELOPMENT OF A PREFERRED SCENARIO

Based on the results of the alternative scenario testing and feedback received from the online and telephone surveys, focus group meetings, public workshops, and the Core Technical Team (CTT) a Preferred Scenario (PS) was created. The Preferred Scenario or preferred land use concept is meant to be a conceptual plan that outlines a development pattern that advances major ideas that the majority of participants in the NEAS supported. Through polling and surveys relative preference was determined for each scenario and its components. The Preferred Scenario is a "blended scenario" that uses components of each of the alternatives to create a conceptual plan that compliments infrastructure investment, improves transportation choice and maintains quality of life in the NEAS Region.

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Please review the Best Practices Policy Guidebook for information on policies used to implement the PS Throughout the process it became evident that there were certain themes that most participants could agree on. In general participants wanted:

- Reduced congestion
- Increased walkability
- More shopping and employment opportunities in the region,
- Re-invigorate established downtowns
- Protection of farmland and other natural resources for economic and aesthetic reasons

The Preferred Scenario addresses these themes. The TCP scenario was used as a basis for the Preferred, but elements of the CP and AIT scenarios were incorporated. In the Preferred Scenario, the conceptual plan includes supporting growth in existing downtowns and in urban service areas while identifying locations where non-residential and mixed-use development would be appropriate. These new neighborhood centers could be walkable areas that provide additional shopping and employment destinations--reducing travel time for work and non-work trips. Also included in the PS is recognition of the importance of the "Green Heart" of the Region—the area of agricultural land that includes key natural features like the Little River water supply watershed and the Mitchell Millpond State Recreation Area. The Preferred Scenario scenarios shows that impacts to the Green Heart can be reduced by encouraging slight reductions in overall density and encouraging growth where not in conflict with this resource.

The Preferred Scenario is meant to be interpreted by local governments and to guide, but not replace, local planning and decision-making. Specifically local governments are responsible for interpretation and implementation of the ideas included in the Preferred Scenario. The Best Practices Policy Guidebook, an accompaniment to this report, provides strategies that support the vision of the Northeast Area Study, including the preferred land use concept.

The table on the next page (Figure 11) indicates that all of the alternative scenarios substantially increased the walkability (number of homes in walkable environments), primarily due to the attention paid to posting anticipated population growth in towns and mixed-use centers. The return on investment (ROI) was highest for the AIT Scenario for the same reason, since growth was concentrated in places where utility extensions were generally unnecessary (reducing costs) and property values (and thus property taxes) were higher. The AIT Scenario fares less well with reducing automobile congestion; a logical finding since this scenario does not add much roadway capacity. However, the TCP/TCPE Scenarios do substantially reduce congestion levels compared to the CP Scenario. All of the alternative scenarios significantly reduce the amount of development in the "Green Heart" of NEAS. Figure 12 provides a conceptual representation of population densities for the Preferred Scenario.

![](_page_34_Picture_0.jpeg)

# scenario planning Performance Metric

Performance Metric	Scenarios & Results				
	СР	AIT	ТСР	TCPE*	
Livability & Health					
Walkability (Homes in Walkable Environments)	25,107	53,667	39,460	39,473	
Protection of Watershed (Acres of New Impervious Surface In WSWs)	287	268	130	139	
Preservation of "Green Heart" (Homes and Jobs Within Green Heart)	17,617	14,419	5,963	6,089	
Economic Vitality					
Return on Investment Estimate	1.41	1.82	1.41	1.48	
Revenue from Growth in Urban Service Areas (in Millions)	184,735	231,170	189,734	200,385	
Lost Agricultural Revenue (Based on farmland impacted by new growth)	\$422,403	\$253,599	\$349,961	\$359,788	
Efficient Provision of Services (New Homes Within Urban Service Areas)	73,635	81,422	75,228	75,293	
Jobs to Housing Balance	0.45	0.45	0.45	0.56	
Annual Cost of Gas Used Per Person	\$1,441	\$1,283	\$1,406	\$1,418	
Growth & Development					
Urban Footprint	76,300	50,220	64,560	68,010	
Average Dwelling Unit Density in Urban Footprint	1.78	2.22	1.89	1.84	
Homes Adjacent to Cities	34,171	42,468	33,509	33,541	
Working Farm Acres Impacted	35,616	21,382	29,508	30,336	
Regional Mobility					
Vehicle Miles Traveled	8,248,716	7,342,370	8,041,442	8,113,851	
Vehicle Hours Traveled	178,726	164,891	169,801	171,152	
Extra Hours in Congestion (compared to free-flow travel time)	9,686	12,573	6,148	5,206	
Average CommuteTrip Length	15.5	15.1	15.3	14.6	
Transportation Efficiency					
Mode Split for Public Transportation	0.5%	0.9%	0.4%	0.4%	
Transit Supportive Growth (New homes within ½-mile of current or planned transit routes (note: routes vary by scenario))	31,702	66,136	44,476	44,404	

Figure 11. Performance Metrics from Preliminary Scenarios

![](_page_35_Figure_1.jpeg)

Figure 12. Representation of Preferred Scenario, with Development Centers




# TRANSPORTATION & LAND USE CONNECTIONS

The NEAS Project generally is making recommendations that cover a long span of time and are moderately to heavily capital-intensive. However, in order to better engage decision-makers as well as the general public that have current transportation concerns, NEAS considered 12 Hot Spots and 12 railroad corridor crossings as well as four corridor concept designs. Each of these recommendations was focused on a specific location identified by members of the CTT, general public and CAMPO staff. Meetings with local planning staff provided key input into the issues at each location, as did field observations.

**Hot Spots.** High crash locations and poor physical roadway geometry were common among the selected Hot Spot locations; typical recommendations include reconstructing intersections to improve poor physical geometry; adding new turning lanes; adding or changing traffic signals; and closing off or realigning five- or six-leg intersections. Each intersection had a traffic analysis performed to determine its useful life with and without improvements; several intersections had both intermediate/low cost recommendations and longer-term, major capital expenditures to provide longer-lasting service periods or better safety performance. Figure 13 describes each Hot Spot.

Hot Spot Location	Challenges	lenges Recommendations Short/Long Term	
1. NC 98/NC 96	high volumes/speeds; STOP-controlled	signalize intersection; roundabout	• • •
2. NC 98/Pearces Rd/ John Winstead Rd	five-leg intersection; poor sight distance	distance relocate Winstead Rd; roundabout	
3. Burlington Mills Road/Ligon Mill Road	high crash rates; poor sight distance	add left-turn lanes; modify signal	• •
4. Rolesville Road/Mitchell Mill Road	skewed approach; high crash rate	realign intersection to offset-T	•
5. Rolesville Road/Fix-It-Shop Road	skewed approach slows turning traffic	add NB left-turn lane	• •
6. Rolesville Road/Old Milburnie Road	SB right turn creating queue	construct exclusive right-turn lane	• • •
7. Rolesville Road/Riley Hill Road	skewed approach; poor sight distance	realign intersection to 90-degrees	• ••
8. Buffaloe Road/Forestville Road	EB left-turn exceeding turn bay lengths; rock deposits make construction costly	add second WB travel lane and SB turning lane	•
9. Buffaloe Road/I-540	High volumes/long queues and delay on I-540 ramp; ultimate "fix" is costly	new WB lane on Buffalo; new, diverging diamond interchange	•
10. Watkins Rd / Old Milburnie Rd / Peebles Rd / Old Crews Rd	Iburnie Rd / six-leg approach roundabout; realign Old Milburnie Rd and Peebles Rd		• • •
11. Wendell Blvd./Buffalo Street	conflict with school intersection; gateway	signalize the intersection; close Wall Street; change school traffic	• • •
12. Knightdale Area RR Crossings	gap from railroad and Mingo Creek; wetland permitting; expense of crossing	connect Widewaters Pkwy with Woodfield Lane; greenway connection to Mingo Creek	٠

Figure 13. Hot Spots and Recommendations



**Railroad Crossings.** The Norfollk Southern (NS) rail line extending through Knightdale, Wendell, and Zebulon is only used one to four times each week for freight, typically carrying bulk soybean shipments. Currently, another railroad company, Carolina Coastal Railway (CLNA), leases the line. Twenty-two individual crossings were initially studied, with 12 crossings identified for additional review and recommendations for improvements. These twelve crossing were chosen based on input from the local planning staffs as well as a review of the geometrical conditions and ranking on the NCDOT Rail Index. As with the Hot Spots, the following is a table (Figure 14) that locates each crossing as well as identifies its challenges, recommendations, and potential for improvement based on likely costs and impacts.

	Railroad	Challenges	Recommendations	Improvement
	Crossing Location		Short/Long lerm	Benefit-Cost
K-1	Bethlehem Rd/First Street	curve in roadway and rail line creating skewed intersection; poor signage	upgrade signage on approach; reduce speed ahead (MUTCD 2C38)	• • •
K-2	Fayetteville Street	recent crash on tracks; humped track; sight distance concerns	scent crash on tracks; humped track; sight istance concerns add signals and gates; warning signage; (long-term) remove by building up roadway	
K-3	Robertson Avenue	proximity to nearby intersections; poor signage	sections; poor signage upgrade signage on First Ave/Hester Street	
K-4	Marks Creek Road	proximity to nearby intersection; poor markings	add directional arrows for warning signs; (mid- term) redesign curb and Marks Creek approach	• •
VV-1	Eagle Rock Road	skewed crossing angle; lack of warning signs	upgrade warning signs; (long-term) realign crossing	•
W-2	Martin Street	Humped track	none	
W-3	Buffalo Street	gap in sidewalk; potential for higher volumes	extend/connect sidewalk	•
VV-4	Main Street	splits downtown; insufficient crossing treatment	connect pedestrian way; add warning signs; (mid-term) add gates for cars and pedestrian crossings	• •
W-5	Hollybrook Road	insufficient crossing treatment; no sidewalks	add crossing gates for cars and pedestrian crossings	• • •
Z-1	Wakefield Street	insufficient crossing treatment; maintenance	(mid-term) add crossing gates; improve drainage	• •
Z-2	Arendell Avenue (NC 96)	major pedestrian crossing in downtown	connect sidewalks and pavement markings	• • •
Z-3	NC 39 (Five-County Stadium)	excessive auto speeds; skewed trackage	upgrade warning signs, potentially flashing warning signage; decrease speed limit to 45mph	• • •

Figure 14. Railroad Crossing Studies and Recommendations



Corridor Concept Designs. Four locations inside NEAS were identified that were larger or longer than the Hot Spot paradigm typically followed, and were generally more complicated than the Hot Spots. Each corridor location has different challenges, but all of them are critical to developing and evolving the downtown core of four separate communities in NEAS. These projects are more than just engineering design to improve traffic efficiency: they have to work within the context of the economic, social, and aesthetic atmospheres of each of their communities.

The four corridors that were chosen are listed below; the actual concept design and description of each are provided on the following pages.

- A. NC 96 from US 1-A to North Cross Street |Youngsville
- B. NC 97/ NC 96 Corridor | Zebulon
- C. NC 39 from Main Street to East Jewett Avenue | Bunn
- D. Smithfield Road from US 64 to Poole Road | Knightdale

# NC 96 FROM US 1-A TO NORTH CROSS STREET Youngsville

## LENGTH: 2,300 FEET OPINION OF PROBABLE COST: \$750,000 OPERATIONAL IMPROVEMENTS: 140 seconds delay/vehicle to 18 seconds delay/vehicle (LOS F to LOS C)

# **PROJECT DESCRIPTION**

With 20% truck traffic and 7,000 vehicles passing through the center of town each day, Youngsville is experiencing difficulty balancing the needs of bicyclists and pedestrians with vehicles traveling through their jurisdiction. The large trucks are causing safety problems and creating operational issues at key intersections. The long-term solution is the construction of a bypass around the town. This interim solution is a combination of streetscape, gateway, Complete Streets and operational improvements that should help alleviate the issues and elevate the entrance to the Town. Improvements include street trees, high visibility crosswalks, mid-block crossings, pedestrian level lighting, gateway monuments, and pocket park. The streetscape improvements would not necessarily require additional right-of-way except at the location of the proposed roundabout. The roundabout is designed (125 foot inscribed circle) to handle the turning radius of a WB-50 tractor-trailer.







LENGTH: 400 FEET OPINION OF PROBABLE COST: \$400,000 OPERATIONAL IMPROVEMENTS: 29 seconds delay/vehicle to 12 seconds delay/vehicle (LOS C to LOS B)

# **PROJECT DESCRIPTION**

NC 96 and NC 97 come together at the crossroads in Zebulon. With its connection to US 64 Bypass to the north and Wal-Mart to the east, this intersection provides a focal point and premier gateway to the community. However, as growth and downtown revitalization have played a significant part in attracting residents and visitors to this area, significant congestion and delay have followed. Each day, 17,000 vehicles pass through this vital intersection. The issue with this intersection is the lack of adequate space for left-turning large vehicles; trucks heading eastbound on NC 97 turning left require vehicles traveling southbound to "backup" to avoid being hit. As a remedy to this and other related problems, a roundabout is proposed. The proposed roundabout is designed to handle the turning radius of a WB-50 tractor-trailer, eliminating the need for vehicles to "back up" while awaiting a left turn.



# NC 39 FROM MAIN STREET TO EAST JEWETT AVENUE **Bunn**

## LENGTH: 3,400 FEET OPINION OF PROBABLE COST: \$1,100,000 OPERATIONAL IMPROVEMENTS: 10 seconds delay/vehicle to 6 seconds delay/vehicle (LOS B to LOS A)

# **PROJECT DESCRIPTION**

Bunn is a rural hamlet closely allied to its Main Street. Main Street has become the focal point of bicycle, pedestrian and auto travel. It also serves as the gateway for civic uses like the high school and library, as well as commercial activity. NC 98 and NC 39 provide service to cross-county commuters as well as residents of nearby Lake Royale. Main Street doesn't warrant capacity improvements; however, it is becoming more difficult to make turns for cars and school buses. Local residents and community leaders have expressed a concern for escalating traffic speeds. Recommendations are for a streetscape and traffic calming strategy with sidewalks, planted median islands, street trees, and three roundabouts at the intersections of Main Street/NC 98 (near Food Lion), Main Street/Bunn Elementary School, and Main Street/Railroad Street. The roundabouts would encourage lower speeds, act as a gateway, and allow buses safe travel.





# SMITHFIELD ROAD FROM US 64 TO POOLE ROAD **Knightdale**

## LENGTH: 13,200 FEET OPINION OF PROBABLE COST: \$6,500,000 OPERATIONAL IMPROVEMENTS: 89 seconds delay/vehicle to 5 seconds delay/vehicle (LOS F to LOS A)

# **PROJECT DESCRIPTION**

Smithfield Road is a two-lane farm-to-market road that provides direct access to US 64 and the Knightdale community. With the opening of the new US 64/264 Bypass, this area has experienced tremendous growth, creating congestion and spillback problems between Poole Road and at its connection with US 64. There is also a need to upgrade the interchange at US 64, which is experiencing significant demand northbound heading westward towards Raleigh and Research Triangle Park in peak periods. There is also an interest in designing this road in context with the surrounding environment, which includes single-family homes and parkland. With this in mind, it is recommended that this roadway be improved to a four-lane road with planted median, street trees, and a meandering sidepath from US 64 to Poole Road. The interchange at US 64 is recommended to be upgraded to a Diverging Diamond interchange (see inset image, below).







# ROADWAY 05





Figure 1. County Housing Costs (line) and Units (bar) 2003-2012

# SYSTEM LEVEL OBSERVATIONS

Much has changed with the once rural crossroad communities that define the NEAS area today. The Great Recession of 2007-08 put a stop to massive residential construction for a period of time, and we have only recently seen revitalized housing development transpire during the recovery period (Figure 1). The NEAS area has done well when measured over the course of the past decade. For example, since the turn of the century we have seen a 57% growth spurt for the NEAS area compared to only 16% growth for the State. With that growth comes the unwanted pressure on transportation infrastructure. Local leaders continue to face the same pressure to create a transportation system that can efficiently move both people and goods. Today's challenge is complicated by the limited funds for transportation projects and competing priorities at the local, state, and federal levels. The following roadway recommendations take into account changing demographics, emerging trends, local into a realized future. To their credit, local officials have acknowledged that focusing all resources on building roads to combat congestion will do little to address region-wide needs. Instead, the regional strategy is to do more with less by focusing on maximizing the existing network and making strategic investments in the highest priority projects (see, for example, the Concept Designs & Hot Spots discussion in the previous chapter).

The NEAS area can attribute a portion of its impressive growth to the presence of roads that serve regional mobility. US 1 (Capital Boulevard) is the most notable of these roads, connecting Raleigh, Wake Forest, Youngsville and Franklinton with many of the Triangle municipalities to the north. This area has also seen the completion of the US 64/264 corridor and the benefits of increased mobility to the eastern areas of Wake County including Knightdale, Wendell and Zebulon. US 401 is the third major mobility carrier for the region, providing direct connection to the Town of Rolesville and eventually Louisburg. When improved, these facilities will provide an important connection to Raleigh, RTP, and I-40.

The Roadway connectivity element of the NEAS Workbook provides a detailed look at recommendations, including the construction and widening of arterials; improving access management and streetscape conditions; and enhancing the network connectivity. This chapter also introduces concepts related to complete streets design.



Figure 2. Existing 2010 Volume-Capacity



Figure 3. E+C Scenario 2040 Volume-Capacity

**Congested Corridors.** Congestion along corridors is related to numerous factors but often results from bottlenecks, primarily at intersections, along the corridor. Aside from individual bottleneck locations in corridors, congestion also occurs when too many people use a route that already operates at or over-capacity.

To assess the impact of proposed roadway recommendations, it is beneficial to model the congestion levels on the roadway network. The Triangle Regional Model was used to report baseline (2010) conditions as well as forecasted 2040 existing-plus-committed (E+C) conditions using projects already under construction or forecasted 2040 existingplus-committed (E+C) conditions using projects already under construction or programmed. These scenarios serve as a baseline for comparison for the roadway recommendations. E+C includes projects already programmed for funding or under construction. The US 401 Improvements (including the Rolesville Bypass under construction as of this writing) is a part of this scenario, while the future I-540 extending southward to existing I-40 is not because there is not currently a funding source identified to construct that project. Figure 2 shows the existing baseline 2010 V/C ratios for the roadways in the NEAS region. Figure 3 highlights the projected E+C 2040 V/C ratios for the roadways in the NEAS area represented within the Triangle Regional Model. Within the 2040 E+C conditions, several major roadways in the NEAS area are forecasted to have congestion issues. The US 401, US 64, NC 98, and NC 96 arterials are all facilities exhibiting congestion issues if they are not improved.



Figure 4. Roadway Conditions Currently, Expressed in the Q/LOS Framework

A second way of evaluating the travel quality of a street is through a quality level-of-service (Q/LOS) measure, developed originally by the Florida Department of Transportation. The Q/LOS model can be applied across all modes of travel; for roadways, the Q/LOS model takes into account specific roadway conditions (e.g., travel speeds, volumes, signal density, etc.) to produce a conceptual planning-level assessment of each roadway link. As can be seen by the amount of green in Figure  $4_{z}$  this assessment did not find many problems at this macro planning scale in current traveling conditions.

Still another way of looking at congestion is the evaluation of travel time, which is the fundamental determinant of how travel demand models assign traffic levels to street segments. The NEAS has traditionally been thought of as a collection of bedroom communities offering affordable housing and a quick commute into Raleigh and RTP. However, with increased development and lack of investment in the transportation system, commuter delays have seen an increase over the past decade. Figure 5 shows the approximate travel time bands for 2010 (base) and 2040 (Existing + Committed). A quick comparison shows that if no additional projects are funded, the average commute time from Bunn to downtown Raleigh will increase by 80%.





Figure 5. 2010 (Left) and 2040 Morning PeakTravel Distances



Figure 6. 2040 MTP Volume-to-Capacity Comparison

Part of the recommendation process was to analyze the performance of the adopted official highway plan (a.k.a. Metropolitan Transportation Plan, or MTP) as well as the Comprehensive Transportation Plan (CTP) for the NEAS region. Figure 6 shows the adopted 2040 MTP V/C ratios for the roadways in the NEAS Region. The results indicate that a few facilities that remained congested even if all the improvements contained in the MTP were constructed. Conversely, there were several projects identified on the adopted CTP plan that could not be justified based on capacity failures. Although some of these projects may have been recommended based on other factors such as safety, spot deficiencies or economic development, all of the projects went through a vetting process in an effort to minimize redundant or overbuilt recommendations while ensuring critical congestion issues were addressed.

**Recommendations** The System Level Observations outlines the deficiencies and needs of the region's network of highways and streets. This section documents how future demand on the roadway system will hamper the local efforts to provide mobility for people and freight within and through the NEAS Region. Coupled with the existing natural, man-made, and financial barriers to building new roads, more emphasis has been placed on maximizing the region's existing infrastructure. The recommendations that follow — representing the shared work of local staff, stakeholders, and the CTT — have been vetted through the public during the second Project Symposium on September 24, 2013.

This exercise produced two roadway recommendation maps. The Official Roadway Map (Figure 7) represents all of the proposed roadway improvements for the NEAS Region and includes a combination of recommendations that generally fall into one of three categories - widening, new location and access management/ streetscape improvements. The second map, Figure 8 is the Roadway Laneage Map. It highlights the appropriate laneage for each section of roadway improvements (widening and new location only). Each segment of roadway highlighted on the Laneage Map corresponds to a recommended cross section. These cross-sections represent a typical design details for roadway features including lane width, median use, shoulder and drainage features, street trees and bicycle/ pedestrian provisions. Example cross sections are shown in more detail in the complete streets section that concludes this chapter. While the recommended cross-sections show what the streets will look like and how they will function, it is important to identify the improvements necessary to reach the preferred vision.





Figure 7. Official Roadway Map



Figure 8. Roadway Laneage Map



in the Northeast Area can be traced back to a failure to heed the relationship between street design/purpose and land design/purpose **Existing Road Widening.** Existing corridors that require more capacity than access management solutions alone can provide to solve congestion and safety issues may require widening to accommodate additional through travel lanes. Based on the NEAS recommendations, there are 139.8 miles of widening projects. The widening corridors highlighted in Figure 7 represent facilities currently operating over capacity or projected to be over capacity within the planning horizon of the 2040 design year. These facilities are grouped by their ultimate cross-section as shown on Figure 8, Roadway Laneage Map.

**New Location Construction.** Building larger facilities such as new freeways or major arterials has become less frequent as the cost of construction (in terms of right-of-way acquisition, materials, and labor) has risen while funding has declined. With these trends expected to continue, facilities recommended to be constructed on new alignment must provide significant congestion relief and/or safety improvements with few alternative options. Based on the NEAS recommendations, there are 33.6 miles of new location projects. These facilities are grouped by their ultimate cross-section, as shown in Figure 8.

**Operations and Access.** The ability of motorists to travel through a given roadway segment is essential for both transportation system efficiency and economic development. Access management balances the needs of motorists using a roadway with the needs of adjacent property owners dependent upon access to the roadway. Poor access management, the function and character of major roadways can deteriorate and adjacent properties can suffer from declining property values and high turnover. This concern is greatest along developed (or developing) corridors such as US 401, Main Street (Wake Forest), US 64 Business (Wendell Boulevard) and Arendell Avenue (Zebulon). The limited funds available for transportation investments make access management an even more important consideration than would otherwise be the case. Access management improvements typically occur within the existing right-of-way and include converting a twoway left-turn lane into a landscaped median or implementing other access management strategies. Signal timing changes and intersection improvements can also improve the operations throughout a corridor at a much lower cost per mile than simply adding additional langeage, and reduce impacts to existing businesses due to construction-related delays. Although these improvements will increase the capacity of the roadway to a degree, the main outcome of the projects will be greater



66%

of Americans want more transportation options so they have the freedom to choose how to get where they need to go. access and mobility, and enhanced traffic safety. Streetscaping and intersection-level improvements can also be considered to enhance the performance of these corridors.

In all, 74.2 miles of operations/access improvements are recommended, including the following key corridors.

- NC 96, Youngsville (see Concept Designs & Hot Spots report)
- NC 39, Bunn (see Concept Designs & Hot Spots report)
- US 64 Business/Wendell Avenue (Wendell)
- Smithfield Road, Knightdale (see Concept Designs & Hot Spots report)

**2040 Roadway Network Performance**. Using the travel demand model, a comparison was made between the 2040 Recommended Roadway network volumes and the 2040 No Build network volumes (Figure 9). The 2040 No Build network represents the existing plus committed roadway projects by federal and state agencies. Based on those project identified as "funded" in the current state TIP, only the following projects are included in the 2040 No Build model run. TIP #U-5307 represents a 6.6-mile corridor upgrade of US 1 between I-540 to south of NC 98. TIP #R-2814 is an 18.5-mile roadway widening project with partial new location (Rolesville Bypass) of US 401 from Ligon Mill Road to NC 39.

Figure 10 highlights the corridors where a significant shift in automobile traffic volumes will occur based on the recommended improvements compared to the No Build Scenario. Roadways like US 64, US 1, Buffalo Road and Poole Road would experience a higher level of traffic diversion, while roadways like US 401, Mitchell Mill Road and Forestville Road would experience a drop in volumes by 2040.

	NEAS Scenario			
Performance Measure	2010 Existing	2040 Current Plans	2040 NEAS Preferred Plan	Preferred Compared to Current
Vehicle Miles Traveled	3,319,904	8,248,716	8,041,442	<b>↓</b>
Vehicle Hours Traveled	64,627	178,726	169,801	↓
Hours of Congested Travel	1,119	14,574	9,405	<b>Ψ</b> Ψ
Commute Trip Time (minutes)	25	29	27	Ŷ
Commute Distance (miles)	15	16	15	↓ ↓



Figure 10. 2040 Recommended Roadway Volumes Minus No-Build



# THE INTEGRATION OF ALL TRAVELERS INTO THE ROADWAY REALM: COMPLETE STREETS

"Complete streets" is a term that describes the transformation of vehicledominated thoroughfares to community-oriented streets with safe, convenient accommodations for all modes of travel. They are designed to be accessible to all types of transportation and, essentially, provide choice. There has been a tectonic shift in the United States from traditional automobile-dominated roadway design to the idea of "completing" streets. Complete Streets incorporate infrastructure into roadway design to move not only cars but also people, cyclists, and transit users.

A Complete Streets (CS) policy creates a platform for planners and designers to consider and incorporate all modes of transportation into the planning and building of new projects as well as into retrofitting of existing infrastructure. Aspects of a typical Complete Streets policy include ensuring the right-of-way is planned, designed, constructed, operated, and maintained to provide safe, comfortable, and convenient access for all users. The North Carolina Department of Transportation has adopted such a policy, and produced a companion design guidance to help communities articulate the needs of their communities and the streets where they travel. Through the public outreach process, the need for complete street applications was expressed by participants and decision-makers in the NEAS Region. Members of the public pointed to speeding motorists, unsafe and unpleasant conditions for pedestrians and bicyclists, and the lack of transit amenities as reason the Complete Streets approach is needed.

The ideal complete street accommodates every travel mode – pedestrians, bicyclists, motorists, and transit riders of all ages and abilities. However, in many cases, Complete Street applications are limited by existing right-of-way or design constraints. Therefore, trade-offs need to be assessed to determine the best approach to implementation of Complete Streets. This is most important when an improvement is made to an existing facility (i.e., widening or retrofit).

Complete Streets Context. Complete streets include three distinct street zones that foster interaction between different modes of travel and adjacent land uses. The three basic context zones are the pedestrian, travelway, and building zones. Together these zones or realms define the space where interaction between modes and the built environment occur.





# **COMPLETE STREETS CONTEXT**

#### **Context Zone**

- Defined by the overall environment and framework of the corridor
- Stresses context-specific treatment for three primary areas:
  - Building form and massing
  - > Pedestrian space and design treatments
  - >Travelway modal integration (bike, transit, vehicular)

#### **Travelway Zone**

- Defined by the edge of pavement or curb line that traditionally accommodates the travel or parking lanes needed for vehicles in the transportation corridor
- · Recommendations focus on modes of travel and medians
- Travelway zone focuses on two objectives:
  - ightarrow Achieve greater balance between travel modes sharing the corridor
  - > Promote human scale for the street and minimize pedestrian crossing distance

## **Pedestrian Zone**

- Extends between the outside edge of the sidewalk and the face-of-curb located along the street
- Quality of the pedestrian realm is achieved through four primary areas:
  - Continuous pedestrian facilities (on both sides of the road if possible) to maximize safety and mobility needs
  - > High-quality buffers between pedestrians and moving traffic
  - > Safe and convenient opportunities to cross the street
  - Consideration for shade and lighting needs

#### **Building Zone**

- Defined by the buildings that frame the major roadway
- Building scale and massing focus on two areas:
  - > Orientation (setbacks, accessibility, etc.)
  - > Design and architectural character (height, etc.)













# BICYCLE & 06





Bicyclists and pedestrians aren't the only ones concerned about high-speed traffic on the narrow, two-lane roadways commonplace throughout the NEAS Region.

# CHAPTER VI: BICYCLE & PEDESTRIAN MOBILITY

# **System Level Observations**

Riding a bicycle or walking, at least beyond the end of a neighborhood street, is a frequently hazardous affair inside the boundary of NEAS. Transportation by walking or cycling is a low-occurrence activity, in large part because of the distances involved from suburban-style tract housing to shopping, workplaces, or schools. However, these distances might be acceptable if the facilities offered were friendly to cycling and walking. As seen in Figures 11 and 12, they generally are quite poor.



Figure 11. Pedestrian Quality Level-of-Service



Figure 12. Bicycle Quality Level-of-Service

Narrow, two-lane roadways comprise much of the public street system in the study area, punctuated by multi-lane highways with even higher speeds and relatively few facilities for cyclists or pedestrians outside of recent commercial development frontages. The paucity of walkers and cyclists instills in the traveling public a poor level of expectation of encountering either of these kinds of travelers, further creating both a real and perceived expectation among the people surveyed that walking and cycling are dangerous activities due to drivers that are negligent or unobservant. For their part, several people that spoke to the issue of cycling viewed cyclists as irritants and hazards to themselves and others, as well as frequently disregarding traffic laws and common courtesy.



A new Neuse RiverTrail access point along Poole Road in the western reaches of the Northeast Area Study boundary. On-street connections can link nearby neighborhoods to the new trail. In spite of this unsupportive environment, cyclists and pedestrians can be seen in various parts of NEAS: long-distance cyclists out for a training ride; casual riders or strollers making their way through the slower-paced downtowns; recretional riders enjoying the Neuse River and other trails; and children cycling and walking to school or near their homes. The 374-square mile Northeast Area Study evaluation of on-street bicycle facilities consisted of a field examination of current conditions, assessment of existing plans and policies and recommendations for the evolution of bicycle facilities in the study area. The vast geography of the study areas makes it difficult to specifically pinpoint a step-by-step project investment strategy; rather the emergence of an on-street bicycle network is likely to occur over several stages based on varying levels of facility investment by development, local communities and the North Carolina Department of Transportation (NCDOT).

Currently, a majority of the roads that connect communities within the study area are two-lane rural highways and state routes that traverse flat and rolling terrain east of the Neuse River. With so many small communities and few major activity generators, there are few current linkages in the system (not already addressed through municipal bicycle plans in Wake Forest and Rolesville) that are suitable to prioritize as primary commuting corridors. State Bicycle Route 2 – Mountains-to-Sea bisects the study area and some of the roads on which it is designated are popular long-distance recreational bicycle routes.

The most prominent bicycle facility in the study area is the Neuse River Trail, a 32.5-mile greenway that recently expanded into the western reaches of the Northeast Area Study boundaries. It is considered to primarily be a recreational trail that runs north-south through the west side of the Study Area. The towns of Rolesville and Wake Forest have developed some short greenway routes through their communities that connect newer neighborhoods to this facility. The Town of Louisburg, which is just outside the study boundary in southern Franklin County, downtown to Vance-Granville Community College. The planned US 401 re-routing around Rolesville is designed to include culverts along the four-lane divided highway to allow for future connectivity of the town's greenway system. On-street bicycle facilities that link these greenways to existing town center, employment sites and other recreational opportunities should be considered a priority for investment by Wake County, the towns and NCDOT.

#### **Recommendations for On-Street Bicycle Facilities**

Given the rural nature of the Northeast Area, recommendations for on-street bicycle facilities are based on an evolutionary tract based on where pockets of new development emerge or where regional parks and greenways should be connected

to existing towns, rural subdivisions, developing employment centers and schools.

NCDOT's Complete Streets Planning and Design Guidelines include several conceptual cross-sections to guide the agency and communities in identifying the starting point for on-street investments in bicycle facilities. The cross-sections contained in the Guidelines are organized by the functional classification of the street or roadway and by prevailing community characteristics (main street, urban, suburban, rural).

**Shoulder and Bike Lane Width.** One element in NCDOT's Complete Street Guidelines that is not recommended for the NEAS Project is the recommended use of a minimum width of four feet for a bikeable shoulder in rural or transitional areas, or bike lanes in suburban locations. Rather, a five-foot width is preferred based on prevailing travel speeds greater than 35-mph on many rural roads inside the study area boundary. NCDOT's 1994 Bicycle Facilities Planning and Design Guidelines makes a similar recommendation for wider widths on high-speed facilities (emphasis added):

**Shoulder Widths:** "If it is intended that bicyclists ride on shoulders, the paved surface must be at least 1.2 m (4 ft) in width...If motor vehicles speeds exceed 60 km/h (35 mph); if the percentage of trucks, buses and recreation vehicles is high; or if static obstructions exist at the right side, then additional [shoulder] width is desirable."



Little River Park between Wendell and Zebulon is a recreational area along a rural road with no shoulders or bike lanes. Bicycle racks at the park go unused due to a lack of bikeable linkages to nearby towns and residential areas. This is important to note in order to avoid communities and NCDOT making a 4-foot shoulder a default condition because:

- A 4-foot shoulder (or bike lane) is barely wide enough to accommodate a bicyclist who is hauling a trailer, particularly a trailer intended for use by a child;
- Bicycle handlebar widths are becoming wider on new long-distance travel and mountain bikes, with handlebar widths approaching 36 inches. This reduces the amount of shy distance provided for a bicyclists if the default width is four feet for a shoulder or bike lane; and
- Reductions in maintenance budgets for NCDOT division offices often means that roadside vegetation control practices are not performed as frequently. Overgrowth from grass, weeds and other foliage can easily overcome the first 12 to 18 inches of a shoulder, rendering that space unusable or unsafe for a bicyclist.

AASHTO's 2012 Guide for the Development of Bicycle Facilities also notes "Shoulder width of at least 5-feet is recommended from the face of a guardrail, curb, or other roadside barrier...It is desirable to increase the width of shoulder where high bicycle usage is expected. Additional shoulder width is also desirable if motor vehicle speeds exceed 50 mph, if use by heavy trucks, buses or recreational vehicles is considerable, or if static obstructions exist at the right side of the roadway."

**Rural Road - Shoulders.** The cross-section contained the Guidelines document that is the best fit for current conditions in the Northeast Study area is the Rural Road, which is characterized by:

- Two vehicular travel lanes;
- A paved shoulder/bicycle zone adjacent to the travel lanes with a width that can comfortably accommodate a bicyclist;
- A green zone between either a multi-use path or a sidewalk.

It is recommended that Rural Road cross-sections that contain bikeable shoulders (or bicycle lanes in some developing areas) are implemented via:

- **Requirements placed on major new development projects** (with greater than 1/3-mile frontage along a rural road) to construct shoulders along their frontage, not only to provide a space for bicyclists but to provide for additional motorist safety and a place for people to walk if they have to be on the road. These new developments will create more demand for use of shoulders and potentially more conflict at ingress/egress points.
- Modernization projects through NCDOT's Division 5 office. NCDOT routinely identifies rural highways (primarily US and State Highway routes as opposed to State Routes – SR) for modernization projects to add shoulders and/or additional lane widths to bring the routes up to modern design standards.

AASHTO Guide for the Development of Bicycle Facilities. 2012. North Carolina Department of Transportation Complete Streets Planning and Design Guidelines. July 2012. pp. 86-87.  Standalone shoulder/bike lane projects can be pursued by Franklin and Wake Counties, as well as the municipalities in NEAS through CAMPO's existing funding streams and the Transportation Alternatives fund. Such funding pursuits should be considered along routes where other large-scale improvement (e.g. multi-lane widening) is not planned in the Transportation Improvement Program.



Rural Road Cross-Section from NCDOT Complete Streets Planning and Design Guidelines

The Complete Streets Planning and Design Guidelines developed by NCDOT is a design-related document, not a treatise on funding policy. Therefore, it is likely that local jurisdictions, both counties and municipalities, will have to cost-share with the State Department of Transportation in the construction of wider shoulders or outside lanes. Two additional recommendations are also made in this document that pertain to this circumstance:

- 1. Towns and counties should set aside a small safety fund to be used as a contingency resource applied to renovation/reconstruction of roadways in their jurisdiction. These funds can be used for wider roadway shoulders, bicycle lanes, crossing treatments, and so forth at the time when the roadways are being planned and designed for rehabilitation. Coordination with NCDOT's District and Division offices should be conducted regularly (every six months) to help ensure that opportunities for partnering are not lost.
- 2. This Plan highlights sections of rural roadways that have horizontal and / or vertical curvatures that make seeing and reacting to cyclists (or tractors, slow-moving trucks, cars pulling out of driveways, etc.) challenging. If improving an roadway is beyond the resources of local and state governments, then these sections at least should be improved to safely accommodate slow-moving vehicles, including cyclists and pedestrians.

**Recommendations for Off-Street Greenways**While on-street bikeways and sidewalks are critical to connectivity, and to vibrant and appealing streets, off-street multi-use paths – collectively termed 'Greenways' – are an increasingly important piece of bicycle and pedestrian networks as well. Residents and leaders of the Northeast Area have consistently communicated a preference for off-street greenways in comparison to on-street bikeways. This preference aligns with options from across North Carolina and the Nation for bicycling and walking options fully separated from motorized traffic.

Many communities across the Northeast Area have made extensive recommendations for greenways previously and identified priorities during their individual planning processes. Those recommendations and priorities, along with regional recommendations from CAMPO's ongoing long-term planning, have been merged into a network for the region that emphasizes inter-jurisdictional connections as well as critical local links. At the local scale, greenway connections are identiifed to link neighborhoods, schools, parks, downtowns, and shopping centers. At the regional scale, connections link towns and activity centers. Samples of these distinct, but equally relevant, set of destinations are summarized in Figure 13. This map series displays the recommended greenway network connecting these destinations. Greenways are categorized as having state, regional, or local significance. State and regional greenways are shown in the overall network map, followed by a map of national and statewide trail systems that cross the study area. The full recommendations at all levels are then presented by subarea, followed by a map of short greenway connections. These short connections are an opportunity to greatly increase connectivity for bicyclists and pedestrians with modest investments.



Figure 13. State and Regional Bicycle / Pedestrian Projects



Figure 14. National and State Systems in NEAS

**National and State Trail Connections** 

Two major trail systems pass through the Northeast Area – the East Coast Greenway and the Mountainsto-Sea hiking trail (Figure 14). Both of these systems are are important tourism draws and economic drivers. Similarly, the statewide bike route system, an on-road network, has existing and proposed routes in the study area. There is an opportunity to expand the economic benefits of these systems by providing greenway and on-road links to nearby towns, accommodations, and services. Greenways tying into the systems should be considered for higher priority.

#### **East Coast Greenway**

The East Coast Greenway is a nationally significant off-road trail connecting cities from Maine to Florida. An alignment that includes on-road and fully separated segments is currently designated, with plans to eventually build out the full trail offroad. The current route does not cross the Northeast Area, but long-term plans for the trail follow the high-speed rail line to the Neuse RiverTrail.

#### Mountains-to-Sea Trail

The Mountains-to Sea hiking trail is a statewide

amenity connecting the western mountains of North Carolina to the coast. This natural surface trail is designed for hikers. The trail is currently a combination of on-road and off-road segments. The route used today aligns with State Bike Route 2 through the Northeast Area. As more trail is built out, the intention is to move the trail off-road to the Neuse RiverTrail heading south.

#### State Bike Route 2 - Mountains-to-Sea Route

As described in the On-Road Bicycle Facilities section, State Bike Route 2 runs across the Northeast Area. The state bike route system was recently updated as part of the North Carolina Statewide Plan, which now recommends that Bicycle Route 2 connectTriangle cities. This route crosses the southern sector of the Northeast Area.

The design of each greenway recommendation shown on the following maps should vary based on context, anticipated user type, and available funding. The term 'greenway' represents a range of bicycle and pedestrian accomodations. That range can be thought of as a continuum from on-street accommodations such as bicycle lanes and sidewalks; separated sidepaths adjacent to roadways; or fully separated paved or unpaved trails along streams, rail corridors, or open space. The recommendations for projects are shown in the following figures; subsequently, the continuum of greenway facility types and characteristics are explained in additional detail.



Figure 15. Northern Area Map - Recommended Greenway Network



Figure 16. US 1 / Franklin County - Recommended Greenway Network





Figure 17. US 64 Corridor - Recommended Greenway Network



Figure 18. Eastern Wake County / Southern Franklin County - Recommended Greenway Network


Figure 19. Opportunities for High-Value Connections

This continuum of typical greenway facility types is presented in Figure 20. Greater detail on design paramters and application of each facility type in the NEAS Region follow.



Figure 20. NEAS - Greenway Facility Continuum

**On-Street Connectors.** While a full network of on-street facilities is recommended in accordance with NCDOT's Complete Streets Guidelines, as described in the previous section, on-street facilities may also be appropriate or necessary as short connectors along off-street greenway corridors. These connections are applicable in space-limited conditions, such as through developed downtown cores. On-street connectors can also serve to connect users from residential and non-residential areas not immediately adjacent to the greenway network. These connections are generally located on or along the conventional transportation system of streets, especially in commercial areas, downtown areas, and near or within parks. On-street connectors that link directly to greenway trails complement the network and are not intended as an alternative to greenway trail development. The characteristics of on-street connector facilities include those listed below.

- Design on-street connections in accordance with the NCDOT Complete Streets Guidelines, with deviations prescribed in the 'On-Street Bicycle Facilities' section.
- Include wayfinding signage in accordance with the NACTO Bikeway Design Guide's recommendations to direct on-street users to off-street greenways
- Provide lighting in high use areas

#### **Local Examples:**

• Franklin Street from NC 98 Bypass to Wait Avenue, Wake Forest

**Sidepaths.** Sidepaths are paved shared-use trails along roadways. They are typically used for active transportation but can also support recreational use. Sidepaths provide a high number of access points to adjacent land uses while maintaining mobility. Where funding and right-of-way permits, sidepaths should be used instead of on-street connectors to provide greater separation for bicyclists and pedestrians. Sidepaths connect to larger neighborhoods and development areas such as retail, employment, and civic uses. These corridors can collect users from trail spurs, rural areas, and the on-road bicycle and pedestrian network. Characteristics for these types of faciliities follows:

- Build sidepaths 8'-10' in width (10' preferred) as a hardened surface such as asphalt or concrete
- Include programmed areas for recreation and education
- Provide an extensive wayfinding signage system as described under On-Street Connectors
- Include ancillary facilities such as restroom buildings and trailheads



An example of an unpaved, shared-use trail in Franklin County.

### Local Examples:

• Falls-of-Neuse Road, Raleigh

Paved Greenway Trails. Paved greenway trails are the preferred bicycle and pedestrian facility in many cases because they support the most diverse and highest number of users away from motorized traffic. Paved greenway trails are used for both transportation and recreation. Because they are designed for a high level of mobility, greenway trails are typically paved and include regulatory signage and pavement markings to control use. These corridors also provide regional connectivity to adjacent jurisdictions. Corridor widths should generally be as wide as can be acquired to help assure the privacy of adjacent property owners and the environmental quality of the corridor. Paved greenway trails can be found along streams, utility easements, or former rail corridors (rail trails). Characteristics are recommended as follows, and are important due to the fact that many cyclists encounter safety issues on poorly designed greenways just as they do poorly designed streets:

• Build paved greenway trails 10-14' in width with centerline striping and other transportation pavement markings;

- Provide a hardened surface such as asphalt or concrete, with 2' cleared shoulders;
- Include regulatory signage along greenway trails as well as at roadway crossings, in accordance with the MUTCD;
- Provide wayfinding signage to and from greenways and along trails indicating mileage and directing users to nearby destinations;
- Include programmed areas for recreation and education; and
- Provide lighting in high use areas and along corridors with commuting potential.

#### Local Example:

Neuse River Trail, Eastern Wake County

**Unpaved Shared-Use Trail**. Unpaved shared-use trails provide a short-term trail development strategy in more naturalized areas. They provide access and connectivity to the greenway network. Because they are unpaved, their upfront development costs are reduced compared to paved trails. Their primary purpose is to connect residential areas or low impact areas to other shared-use trail facilities. Unpaved shared-use trails provide a high level of access to neighborhoods but a low level of mobility. Pedestrians and bicyclists with off-road tires typically use them recreationally so they occur in short segments (one mile and under). Corridor widths should allow for sufficient buffering between neighborhoods and adequate area for the free movement of wildlife. Trail connections are sometimes made between lots in subdivisions. Over time, as funding becomes available, these



An example of a single-track, or "soft," trail in Wake County. (source: TriangleMTB.com)

corridors should be paved to support more diverse use. Characteristics of these facility types are recommended as follows.

- Design width varies depending on the type of connection
- Build with a natural surface or stone fines surface
- No lighting is required and minimal furnishings suffice
- Include wayfinding signage so residents are aware of access points
- Typically occur in short segments

#### **Local Examples:**

• Franklin County Nature Preserve Trail, near Louisburg

**Single-Track Shared-Use Trail.** Single-track shared-use trails, sometimes called "soft trails," are very narrow trails with natural surfacing. They occur in more forested or open space areas and allow for shared use with adequate etiquette signage. Single- track trails are typically used by off-road bicyclists and hikers for recreation. Sometimes single-track trails provide important access to targeted destinations such as parks, enhancing connectivity and recreation. They can be constructed affordably in environmentally sensitive or topographically constrained areas. Volunteers can build single-track trails with the oversight of a professional trail builder. Single-track trails are unique in that the network can be designed for the experience by looping or switching back to increase mileage, or terminating at the connecting destination depending on available land. Characteristics are recommended as follows:

- Build trails 18"-36" in width with bare earth or other natural surfacing; wooden structures over stream crossings may be useful in promoting shared use and preserving stream integrity
- No lighting is recommended
- Provide etiquette and wayfinding signage to encourage users to share the trail
- Minimize amenities to reduce environmental impacts and maintain a natural feeling

#### **Local Examples:**

HeritageTrail, Wake Forest



# BUSTRANSIT & 07





#### **System-Level Observations**

The end of World War II heralded a period of unprecedented housing development in the United States. Housing was in high demand and housing developers responded by constructing single-use housing subdivisions away from city centers, creating a development pattern that continues today. One largely unforeseen consequence of this type of new development occurring predominantly on the outskirts of established urban areas was the increased reliance on the automobile as the primary mode of transportation and the subsequent decline of transit use by the mainstream workforce.

Despite this gradual downturn over the past several decades, transit remains an important component of the transportation system in the Triangle Region and in the Northeast Study Area. During the course of our public outreach for this study, it became clear that people still value transit as an important component of their transit system and want to see services expanded and enhanced. Documents such as the Wake County Transportation Plan and Transit Plan attest to its importance, while the ongoing discussions surrounding commuter rail and light rail in the Triangle Region are further indications of transit's place in the community. Some of the current transit services and transit operators in the Triangle and NEAS are outlined below.

**Triangle Transit.** Triangle Transit provides regional transportation service across the Triangle Region through a diversity of services, including bus and shuttle service, paratransit, ridematching, and vanpools, among others. Triangle Transit extends into Durham, Orange, and Wake Counties, and serves Apex, Cary, Chapel Hill, Durham, Garner, Hillsborough, Knightdale, Raleigh, the Research Triangle Park, Wendell, Wake Forest, and Zebulon. Three Triangle Transit express bus routes serve the Northeast Study Area including the WRX, which serves Wake Forest; the KRX, which serves Knightdale; and the ZWX, which serves Wendell and Zebulon. Express bus service is defined as service with few stops, high frequency during peak commuting hours, and service that is intended to be much faster than regular bus service. Express buses usually only operate during peak commuting hours and often take faster routes to the final destination, the goal being to get people to work as quickly as possible. As express services, these bus routes all link directly to the Moore Square Station in downtown Raleigh. Three local connector services, the Wake Forest Circulator, the Triangle Town Connector, and the Trawick Connector also provide service into the study area.

**Capital Area Transit (CAT).** Capital Area Transit provides local service throughout Raleigh and to some surrounding communities. Local service follows set routes, connects local community destinations, operates on a fixed schedule, and usually serves areas within one community or service area. Offering 26 fixed-route buses, three express routes, and two small circulator routes, the CAT system provides substantial coverage across Raleigh and to local communities in Wake County. The Wake Forest Loop and Route 25L Triangle Town Center serve the Northeast Study Area.

**TRACS.** Transportation and Rural Access (TRACS), operated by Wake Coordinated Transportation Service, provides demand-responsive service to the residents of the non-urbanized areas of Wake County. Demand-responsive service, often known as paratransit or dial-a-ride service, is flexible door-to-door service that provides transportation to destinations within a certain service area. These services are often provided in areas without other public transportation systems and are occasionally restricted to elderly or disabled populations. The TRACS service divides Wake County into four zones and provides seat-available service (Monday – Saturday) and reserved service (Monday, Wednesday, Friday). The rates are divided by In-Zone at \$2 per one-way trip and \$4 per round trip and Out of Zone at \$4 per one-way trip and \$8 per round trip.



Figure 21: NEAS Transit Vision

**KARTS.** LikeTRACS, KARTS is an on-demand public service that provides trips to riders that call in advance to destinations in Franklin County, as well as Granville, Vance, and Warren counties. Service is limited to the hours between 8am and 5pm during weekdays only, and the fares are priced according to distance: \$4 initially and then \$1 for each additional zone that the van must pass through to deliver the passenger to their destination. Fares can be reduced depending on age (senior and 12 years of age or younger) and ADA status.)

#### Recommendations

Transportation and land use are inextricably linked. Despite the dispersed and distinctly transit unfriendly nature of much of the current development patterns in the Northeast Study Area, public input from the Mobility Chip Game, the Metroquest Survey, and the Traveling Roadshow presentations indicate that including transit in plans for future growth and development strategies is integral to residents' vision of a sustainable and livable community. Overall, the NEAS Region is not well served by fixed-route public transit service, and its overall development densities and connectivity do not support frequent, high-quality transit service. In order to accommodate the forecasted future growth, maintain quality of life, and provide a diversity of transportation options in the area, transit service should be implemented in the form of commuter rail, fixed-route bus service, and express bus service.

The transit recommendations for new/additional service are listed below based on the timing of implementation suggested by future population densities growth in the respective corridors (short-, medium- and long-term).

## WHAT NEAS COMMUNITIES HAVE TO DOTO GET BETTER TRANSIT?

Mass Transit needs mass (people) to make it work – here are some important markers for service levels; see the Policy Guidebook for how to get there.

- More People. NEAS towns needs to have at least 10 residents per acre in their core.
- 2. Even More People. About 30 combined residents and employees per acre are needed in a transit center to make light rail viable; 45 or more per acre for commuter rail.
- 3. But Design Counts. The above densities of people and employees are wildly different in practical experience (see text box on the following page), mainly due to the environment of the station. People should be within a half-mile walk of the transit center or closer, if possible, to maximize ridership potential. This means that amenities, quality building design, and streetscaping in addition to sidewalks, safe crossings, and bicycle facilities are necessary.

- Expanded Local Service Wake Forest to Raleigh (Shorter Headways)
- Express Bus Zebulon to Raleigh (Shorter Headways)
- Local Service Rolesville to Raleigh
- Local Service Knightdale Circulator Bus Service
- High Frequency Transit Wake Forest to Triangle Town Center
- High Frequency Transit Wendell to Triangle Town Center
- Express Bus Franklinton to Raleigh
- Express Bus Bunn to Raleigh
- Commuter Rail Zebulon to Raleigh
- Commuter Rail Wake Forest/Franklinton to Raleigh

However, a successful transit strategy does not only encompass improving ridership. A comprehensive transit strategy involves coordinating urban design policies, land use and zoning practices, and transportation planning programs. More information about transit-supportive policies is presented in the paragraphs below.

Urban Design Policies/Land Use and Zoning Practices. Urban design polices refer to actual design features of the built environment and the standards that govern how places are created. Land Use and Zoning practices encompass the regulatory practices that govern the types of development and the intensity of development in a particular area. In this case, the following practices encourage and support different levels of transit service.

• **Pedestrian-Scale Design.** Transit-supportive design elements are often synonymous with pedestrian- and bicycle-friendly design elements. While automobile travel is often not supportive of trip chaining, defined as the use of multiple modes in one trip, walking, bicycling, and transit use often support one another. In fact, a transit user's beginning and final destination is often likely to be a short walk, usually not more than 1/4 miles, away from a bus stop. To increase the likelihood that people will use transit, planners should ensure that areas surrounding transit stops are safe, attractive, and welcoming to pedestrians.

<u>Recommendation</u>: Encourage communities to develop nodal centers that focus on safe, comfortable, and attractive places to walk and gather.

Jacobs, Jane. (1961). The Death and Life of Great American Cities. New York: Random House.

# ...BUT MORE PEOPLE MAY NOT BETHE ONLY KEY TO SUCCESS

"We had public officials claiming this was going to be a huge failure," says Chad Saley, a spokesman for the Utah Transit Authority. "They didn't support it at all. Now they're some of our biggest supporters. They can't wait until they get their own extensions."

Dennis Nordfelt, mayor of West Valley City, a Salt Lake City suburb, was one of those people. He made the arguments that his hometown wasn't dense enough to support light rail and people wouldn't leave their cars to take the train. Today Nordfelt is "very proud" of the light rail line and calls its expansion an "absolutely important" issue on par with water. He also admits that "crow tastes pretty good if you put enough salt on it."

"I was just flat out wrong," Nordfelt says. "I'm now a light rail convert and rider. I don't go uptown in my car unless I absolutely have to."



• **Mixed Uses:** Part of creating a safe, attractive, and stimulating environment for pedestrians is encouraging a mix of development around transit stations. By including office, residential, and commercial amenities or even parkland close to transit stations, planners can achieve what Jane Jacobs called "eyes on the street." This concept refers to the presence of people on the street at all times of day and night, reducing the likelihood that criminal activity will go unobserved. Also, mixed uses attract people of all kinds, both rich and poor and young and old. In creating an environment friendly to pedestrians and with a diversity of stores, restaurants, offices, and living quarters, the main attraction may not be the amenities themselves, but the presence of community.

<u>Recommendation</u>: Revise zoning codes to allow for or encourage mixed use development and create overlay districts mandating mixed use development around transit stops.

• **Density:** Another fundamental element of developing areas to support transit is density. If people are going to take a bus or train, including the variety of mixed-uses within a short distance, usually ¼-mile of the stop, will draw more people to the area. This will often require building up instead of out and ensuring that major attractions are located in close proximity to the transit stop. By including residential development close to transit stops, people will be much more likely to use the transit service for commuting, shopping, and recreational trips. The text box on this page illustrates some very broad density thresholds for public transit. ,

<u>Recommendation:</u> Revise zoning codes to stipulate minimum density levels around transit stops. Create policies that require dense developments around nodes.

• **Connectivity:** Creating a safe and attractive area for walking around transit stations is only part of the puzzle. Ensuring that walking (and bicycling) is the most convenient mode of transportation will encourage people to walk (and bike) more. Considering non-motorized transportation as a priority within close proximity to transit stations will only contribute to the success of the transit service.

<u>Recommendation:</u> Use zoning and form-based codes to create safe pedestrian and bicycle access to amenities near transit stops. Create municipal connectivity policies.

<sup>2</sup> Guerra, Erick and Cervero, Robert, "Cost of a Ride: The Effects of Densities on Fixed-GuidewayTransit Ridership and Capital Costs," UCTC UCTC-FR-2010-32 (www.uctc.net/research/briefs/UCTC-PB-2011-02.pdf). August 2010.

<sup>3</sup> Guerra, Erick and Cervero, Robert, "Urban Densities and Transit: A Multi-Dimensional Perspective," Working Paper UCB-ITS-VWP-2011-6 (<u>http://www.its.berkeley.edu/publications/UCB/2011/VWP/UCB-ITS-VWP-2011-6.pdf</u>]. September 2011.

• **Parking Management:** While providing vehicular parking is certainly important, large surface parking lots tend to detract from the visual appeal of a location and also create problems with safety and stormwater management. If possible, parking should be placed away from areas where people are walking, while parking structure solutions should be supported through mixed use development.

Recommendation: Create policies, such as maximum parking limits, to constrain the development of large surface parking lots. Adopt shared parking policies. Charge the market rate to park when downtown parking availability necessitates mandated turnover.

• **Placemaking:** All of these policies are designed to encourage people to walk and bike to transit stations, while also ensuring that walking and biking are safe, convenient, and attractive options. Additionally, these policies seek to foster a sense of place around transit stations. By using transit as the centerpiece of place, people will be attracted to an area for the amenities located nearby in addition to using the transit station as a regional transportation hub.

<u>Recommendation:</u> Incorporate elements in to the transit station to make it a "place", i.e. attractive, iconic, safe, comfortable. Use architectural elements to **enhance the appearance and incorporate public art into station design.** 

• **Transportation Demand Management:** In addition to urban design policies and land use and zoning practices, non-governmental entities can also help encourage transit use. By providing showers at work or incentivizing alternative transportation through free bus passes or parking cash-out schemes, companies can encourage people to take transit and make it easier for those that do. Allowing employees to have flexible schedules or to telework are other options for companies to encourage using modes other than the automobile.

<u>Recommendation</u>: Create policies to unbundle parking costs at workplaces. Work with employers to encourage more transit use. Provide tax incentives if employees use transit.

Jon Zemke, "Density Vs. Transit," Metromode <u>www.metromedia.com/features/Transitdensity0020.aspx</u>, July 28, 2011.



Figure 22. Phase ITransit Development. With the current levels of development density in NEAS limited transit service to the larger towns are provided



Figure 23. Phase II Transit Development. If the area continues to grow and develop in a way that supports mixed-use, higher density, and more economic activity, transit services can and should expand to cover a larger geographic area



## Park-and –Ride Lots

While policies are very important in encouraging the style and intensity of development to support transit, providing additional on-the-ground facilities that encourage transit use is crucial to achieving a high-quality transit system. Park-and-ride lots are absolutely fundamental in increasing the catchment area around stations and usually provide free, convenient, and secure parking for transit riders. While some park-and-ride facilities are purpose-built and may include parking structures, underused or unused parking lots are often designated as park-and-ride facilities. Occasionally, businesses without substantial daytime traffic or particularly under-utilized parking lots will allow a portion of the parking area to be designated as a park-and-ride, with the expectation that some transit riders will frequent the nearby/neighboring business(es). The transit provider may also be subject to leasing fees, if such an agreement cannot be reached. Park-and-ride lots, as with transit priorities, are presented in this document in phases.

#### **Transit Priorities**

In order to refine our transit recommendations, we prioritized transit improvements based on the requisite densities necessary to support each improvement. The presence of dense pockets of development is fundamental to supporting more intensive forms of transit such as commuter rail and high frequency bus.

<u>Phase 1.</u> The current development patterns in the Northeast Study Area consist of townhome development at the relative lack of density, our recommendations for the first phase are:

- Reroute the existing express bus to Zebulon (ZWX) to stop in Knightdale;
- Add Knightdale Circulator Bus Service; and
- Decrease headways on Express Bus Services.

These low cost improvements should be implemented with the goal of bolstering ridership. Using the Wake County transit plan as a basis for referencing the number of bus passengers targeted per service hour per service type, the proposed expanded level of transit service is likely to be supported. Small town circulators typically require 12 bus passengers per hour to be viable, while commuter service relies on 18 bus passengers per hour. As Wake Forest already has a circulator bus, Knightdale can also link their express bus route to the circulator route to provide service to a larger area in the community. The existing park-and-ride lots that are currently in the Northeast Study Area will suffice to support the Phase 1 transit priorities. The graphics on the preceding page provide an indication of current and potential future (2040) densities in the Northeast Study Area. <u>Phase 2.</u> As the Northeast Area Study communities continue to grow and expand, higher density areas around the city centers will provide more support for increased transit service. If density-supportive policies are implemented, this process is likely to be expedited.

However, this process takes time. Overall, much of the "green heart" would remain primarily rural, while pockets of density are clearly apparent in areas around Raleigh and Wake Forest as well as in Knightdale and Zebulon to a lesser degree. This type of density is likely to support more urban center housing and retail development, while less dense areas would be characterized by townhome-style development. To support the increasing density, two park-and-ride lots are suggested during this phase, one in Franklinton and the other in Rolesville. For this level of density, we would recommend the following.

- Local Service Rolesville to Raleigh
- Local Service Wake Forest to Raleigh
- Express Bus Franklinton to Raleigh
- High Frequency Transit Wake Forest to Triangle Town Center

Phase 2 improvements focus on increasing the geographic scope of transit service in the region. Again, the Wake County Transit Plan suggests bus passenger thresholds for service by service hour and service type. Local service requires 12 passengers per service hour, commuter service is supported with 18 passengers per service hour, and higher frequency transit will operate smoothly at 25 bus passengers per service hour. With higher densities in Wake Forest, Rolesville, and areas of northeastern Raleigh, this level of transit could be supported in the region.

Local service will link Wake Forest and Rolesville with the Triangle Town Center transit hub. This service will allow for more than simple commuting trips, serving as a local connector into Raleigh with all-day service. The Wake Forest Express Bus service would be extended to Youngsville and Franklinton and would run more frequently. Wake Forest would also be linked with Triangle Town Center via a high frequency route that would run all day and also provide late night and weekend service. During peak hours, this route would operate at 15-minute-or-less headways.



Figure 24. Phase III Transit Development. If NEAS continues to grow at a pace similar to that experienced in the previous decade (pre-Recession era), then rail transit service is a feasible option, at least in terms of demand. Operational and trackage ownership challenges face any rail project attempting to share space with freight or long-distance passenger providers.

Phase 3. If this Region continues to grow and increase in density at a rapid pace, rail transit is an option to consider in the Northeast Study Area. In particular, using existing railroads as commuter rail lines to reach Zebulon, Wendell, and Knightdale on one side and Wake Forest on the other would be a potential rail transit opportunity. It is likely that household densities along the rail corridors would support rail as a viable transit option. A park-and-ride lot at Wendell Falls Parkway as well as a new transit station will further link the rail system with extant high density development. In Phase 3, we recommend:

- Commuter Rail Zebulon to Raleigh;
- Commuter Rail Franklinton to Raleigh;
- High Frequency Transit Wendell to Triangle Town Center.

Bunn is likely to be dense enough to support an express bus route to the town and will also receive a park-and-ride lot, while providing a high frequency link between Wendell and Triangle Town Center will provide important access to a major transit hub. In addition, transit service often provides direct access to Raleigh; this high frequency route will allow people to access North Raleigh and Wake Forest without traveling to Raleigh first.

In providing commuter rail service, some Express Bus service will be rendered obsolete, specifically the Express Bus services to Wake Forest and Zebulon. These bus lines would be discontinued once the commuter rail system is in operation.

